

Linear Collider Working Group Conclusions and Recommendations

Presented for Steve Holmes

By Joel Butler

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Conclusions

- The physics program enabled by the linear collider addresses the most important questions of fundamental particle physics.
 - The linear collider is listed as the highest priority mid-term facility within the DOE/Office of Science twenty year plan.
- The Fermilab Director has expressed the desire that Fermilab work with the world community to bring a linear collider to northern Illinois.
 - *Recommend: Fermilab reiterate its desire to serve as the host laboratory for a linear collider.*
- The establishment by Fermilab of the linear collider as a high, or the highest, priority item for its long-range future will significantly enhance the prospects of such a facility being constructed. [Note to the subcommittee: This is something Ritchie proposed as a recommendations, but it's really a conclusion. I am happy to have people's reaction to this]

- R&D and engineering design for a linear collider requires resources beyond those currently invested at all levels: Fermilab, the U.S., the world.
- Significant obstacles currently exist to the U.S. assuming the role of host nation for an international linear collider project.

Both warm or cold technologies are being developed that could support a linear collider with performance as defined by the ALCPG.

[However, the superconducting technology has more natural synergies with other options for Fermilab's future programs. **Need to discuss with full committee where/if this observation fits within the FLRPC report.**]

For Fermilab to establish itself as host lab to a linear collider will require significantly enhanced efforts on:

Technology R&D

Site studies

Public outreach

Support from the Fermilab scientific staff

Governance models

Recommend: A full-time person should be appointed within the Directorate with responsibility for coordinating and directing all Fermilab activities and providing communications to outside institutions on linear collider. This should include both creation and execution of a coherent plan addressing all the above items.

- The R&D and engineering design phase for a linear collider represents a very significant technology development program in its own right.
 - A full-scale systems engineering test (referred to as the Engineering Test Facility, ETF) is likely to be required as a pre-requisite to a U.S. commitment of funds to construct.
 - Siting of the ETF at Fermilab will provide a unique opportunity to develop linear collider expertise within the Fermilab scientific and engineering staff.
 - *Recommend: Fermilab initiate efforts to coordinate development of design studies for both warm and cold ETFs, in collaboration with international partners, with a goal of siting the ETF for the chosen technology at Fermilab.*
- It is essential that Fermilab base its planning on a realistic view of an achievable linear collider timeline.
 - The LC Subcommittee's analysis of the sequence of events leading to approval and construction indicates the [earliest] plausible date for a linear collider start of physical construction is in the 2011-2012, at least within the U.S.
 - *Recommend: The FLRPC adopt a 2011-2012 date for the start of LC physical construction in its planning process.*

- Fermilab resources currently invested in linear collider R&D amount to approximately \$4M per year. If Fermilab desires to host a linear collider this needs to grow to at least \$20M/year at the time of ETF construction. Assuming Fermilab is designated the host laboratory, effort will have to expand to at least \$100M/year at the time of the construction start.
 - In the event that Fermilab is not the host site, but U.S. is host country, we imagine Fermilab investment during the construction phase at roughly 2/3 this level.
 - In the event that U.S. is not host country we imagine Fermilab investment during the construction phase at 1/3 this level.
- The world community appears to be moving towards a governance model incorporating a host laboratory and an international project that have independent management structures.
 - Such a model allows Fermilab to sustain a forefront hadron-based research program through the design and construction phases (at least) of the linear collider.
 - *Recommend: Fermilab planning should be based upon the host laboratory/international project model.*

- There exists a danger that “Plan A/Plan B” gridlock will prevent Fermilab from establishing any viable plan for its future.
- *Recommend: The FLRPC should decouple the linear collider (Plan A) from other major initiatives, e.g. Proton Driver, (Plan B) for the immediate round of planning. The FLRPC should recommend how to evolve the relationship of these activities over the next few years as prospects for the linear collider become clearer.*

Recommendations

To the FLRPC

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Recommend: The FLRPC should decouple the linear collider (Plan A) from other major initiatives, e.g. Proton Driver, (Plan B) for the immediate round of planning. The FLRPC should recommend how to evolve the relationship of these activities over the next few years as prospects for the linear collider become clearer.

To the Director

Recommend: Fermilab reiterate its desire to serve as the host laboratory for a linear collider.

Recommend: A full-time person should be appointed within the Directorate with responsibility for coordinating and directing all Fermilab activities and providing communications to outside institutions on linear collider. This should include both creation and execution of a coherent plan addressing:

- Technology R&D
- Site studies
- Public outreach
- Support from the Fermilab scientific staff
- Governance models

and incorporating:

- Establishment of a realistic timeline in consultation with the USLCSG
- Preparation of a bid to host the Engineering Test Facility
- Preparation of the Fermilab component of the U.S. bid to host an international linear collider facility.
- Fallback plans in the event that the linear collider is sited elsewhere

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Recommend: Fermilab planning should be based upon the host laboratory/international project model.